

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Establishment of an Interference Temperature)	
Metric to Quantify and Manage Interference and)	ET Docket No. 03-237
to Expand Available Unlicensed Operation in)	
Certain Fixed, Mobile and Satellite Frequency)	
Bands)	
)	

**JOINT REPLY COMMENTS OF
THE ASSOCIATION FOR MAXIMUM SERVICE TELEVISION, INC., AND
THE NATIONAL ASSOCIATION OF BROADCASTERS**

Dated: May 5, 2004

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SUMMARY

A clear majority of comments filed in response to the Commission's Notice of Inquiry and Notice of Proposed Rulemaking criticized the interference temperature approach. In fact, not a single commenter supported the interference temperature approach as described by the Commission, with the handful of parties that offered some support for the approach offering, at best, qualified support. The comments recognized that the proposed interference temperature concept is fraught with technical challenges that make its implementation impractical and potentially disastrous. Tellingly, even proponents of unlicensed devices — those that stand to gain from unlicensed underlay operations that the interference temperature approach seeks to permit — recognize that the interference temperature approach suffers from significant technical flaws and is not viable.

The clear majority of comments also criticize the potential harm that unlicensed devices would cause if permitted to operate in licensed spectrum bands under the interference temperature approach. In light of the significant technical challenges to accurately measuring the interference temperature, users of licensed services are likely to face harmful interference and loss of service. Several commenters also agreed with MSTV and NAB that once unlicensed devices are introduced into licensed spectrum bands, they will be impossible to locate and control should they cause interference.

The broadcast spectrum bands are particularly ill-suited for unlicensed underlay operations in part because broadcasters do not control the technical characteristics of TV and AM/FM receivers. Broadcasters will therefore be powerless to even attempt to solve interference problems caused by new unlicensed devices. Moreover, in light of the already complex transition to DTV and the transition of radio broadcasters to In Band On Channel digital

technology, even the suggestion that unlicensed devices would be permitted in these spectrum bands will only cause more uncertainty, and would complicate and further delay these transitions.

MSTV and NAB urge the Commission to recognize the widespread opposition to the interference temperature approach. The Commission should not implement the interference temperature metric as a means of managing interference.

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A clear majority of comments filed in response to the Notice of Inquiry and Notice of Proposed Rulemaking (“*NOP*” and “*NPRM*,” together, “*Notice*”)¹ in the above-captioned proceeding are critical of the interference temperature approach as a means for managing interference. The Association for Maximum Service Television, Inc. (“MSTV”) and the National Association of Broadcasters (“NAB”)² largely share this view, and urge the Commission not to use an interference temperature approach as proposed to manage spectrum use.

The parties that filed comments in response to the *Notice* were united in their criticism of the interference temperature metric and its potential use to introduce unlicensed

¹ *Establishment of an Interference Temperature Metric to Quantify and Manage Interference and to Expand Available Unlicensed Operation in Certain Fixed, Mobile and Satellite Frequency Bands*, Notice of Inquiry and Notice of Proposed Rulemaking, ET Docket No. 03-237, FCC 03-289 (rel. Nov. 28, 2003).

² MSTV is a non-profit trade association of local broadcast television stations committed to achieving and maintaining the highest technical quality for the local broadcast system. NAB is a non-profit, incorporated association of radio and television stations that serves and represents the American broadcast industry.

devices operating in licensed spectrum on an underlay basis. Such criticism came not just from incumbent spectrum licensees, who discussed in detail the threat posed to their services by unlicensed devices that would operate under the interference temperature approach, but even from equipment manufacturers and, most tellingly, proponents of unlicensed operations — the very parties who would stand to gain from the increased access to spectrum for unlicensed devices that is the primary goal of the interference temperature approach. The Wi-Fi Alliance, a trade association that supports the adoption of unlicensed devices and related standards, concluded:

In summary, while we strongly support the underlying goals of the instant proceeding to increase both the efficiency of spectrum utilization and access to spectrum, we urge the Commission to proceed with the utmost of caution, if at all, with even limited implementation of the interference temperature approach³

MSTV and NAB wholeheartedly agree.

I. A MAJORITY OF COMMENTERS BOTH CRITICIZED AND OPPOSED THE INTERFERENCE TEMPERATURE CONCEPT.

The clear majority of parties that filed comments in response to the *Notice* opposed virtually every aspect of the interference temperature approach to spectrum management. Commenting parties that were critical of the interference temperature approach represented the entire communications industry — including wireless service providers, satellite companies, broadcasters, fixed wireless operators, equipment manufacturers, and critical infrastructure entities. Even unlicensed proponents such as the Wi-Fi Alliance opposed the interference temperature concept as being impractical, insufficiently tested, and otherwise flawed.

³ Comments of the Wi-Fi Alliance ¶ 14.

The handful of parties that offered some support for the interference temperature concept expressed at best qualified support, acknowledging the significant technical problems associated with implementing the concept.⁴ Perhaps most tellingly, not a single party supported the interference temperature approach as described in the *Notice* or thought that it was ready for real world implementation. Accordingly, MSTV and NAB urge the Commission not to go forward with using the interference temperature approach as a spectrum management tool, including using the interference temperature approach to justify unlicensed underlay operations in licensed spectrum bands.

A. The Interference Temperature Concept Is Fraught With Technical Challenges And Is Not Ready To Be Implemented.

From the time the interference temperature concept was first introduced in the *Spectrum Policy Task Force* proceeding, MSTV and NAB have argued that such a concept was at best a theory and that significant technical challenges had to be overcome before it could be implemented in the real world.⁵ The comments filed in response to the *Notice* overwhelmingly support this view.

Several commenters discussed the problems associated with measuring interference temperature in real-world operating conditions.⁶ Motorola, for example, summarizes several of the technical challenges that make such measurements extremely

⁴ Comments of Agilent Technologies, Inc. at 5–6; Comments of Proxim Corp. at 2–11; Comments of IEEE 802 ¶¶ 18–20.

⁵ See Comments of MSTV and NAB, ET Docket No. 02-135, at 8–9 (Jan. 27, 2003); Comments of MSTV/NAB at 5–8.

⁶ Comments of Motorola, Inc. at 11–14; Comments of Cingular Wireless, LLC and BellSouth Corporation at 18–28; Comments of Verizon Wireless at 5–12; Comments of The Wireless Communications Association International, Inc. at 14–22; Proxim Comments at 2–11.

complex.⁷ The problem of shadowing — also known as the “hidden transmitter” problem⁸ — is caused by physical obstructions and makes interference temperature measurements at the location of a measuring device different from the actual interference temperature at a receiver.⁹ As Verizon Wireless notes, because noise levels and interference “vary from one moment to the next . . . crude spatial or temporal averaging will provide [users of licensed services] no useful protection against interference.”¹⁰ NAB and MSTV wholeheartedly agree. Further, as the Wireless Communications Association states:

[F]ocusing on measurements taken at the underlay devices is a non sequitur in this proceeding — if the idea of interference temperature is to move the focus of interference protection from the transmitter to the receiver, it would be inexplicable to implement an approach that measures interference temperature at the underlay transmitter, rather than at the licensed victim receiver.¹¹

Thus, it makes little sense to allocate licensed spectrum for unlicensed devices based on a measurement taken at the transmitting device, a device incapable of determining the location of and its effects on nearby receivers of licensed services.

Other technical challenges to measuring and predicting interference to a victim receiver include uncertainty relating to the path loss between various licensed primary and unlicensed secondary transmitters and receivers, the sensitivity of the devices detecting the interference temperature, the modulation scheme employed by transmitters, and the

⁷ Motorola Comments at 11–13. *See also* Cingular Wireless and BellSouth Comments at 3–4 (citing the Commission’s failure to address the “legal, policy and engineering” comments filed by over twenty-eight parties in the Spectrum Policy Task Force proceeding, ET Docket No. 02-135). NAB and MSTV agree that it is “entirely premature to move forward with proposed rules . . .” *Id.* at 4.

⁸ MSTV/NAB Comments at 7 n.15.

⁹ Motorola Comments at 11.

¹⁰ Verizon Wireless Comments at 10.

¹¹ Wireless Communications Association International Comments at 21.

characteristics of the antennas used by the primary users.¹² Many of these technical challenges would be even more complex in bands that are shared by more than one licensed service. The majority of commenters recognized these and other technical challenges that would have to be overcome before the interference temperature metric could be implemented. As Nokia aptly states, “[u]ntil we better understand the capabilities — and challenges — of these technologies, the Commission should avoid basing current policy on future unknowns.”¹³

Significantly, even parties that support additional opportunities for unlicensed operations recognize that the interference temperature approach discussed in the *Notice* is not viable. The Wi-Fi Alliance describes the difficulty in making accurate interference temperature measurements:

In cases dominated by interference from a limited number of sources — e.g., interference from an RFID transmitter into a broadcast receiver, local propagation conditions vary so much that measuring the noise level at any given point does not provide reliable information about the observed noise level at a nearby point.¹⁴

Proxim Corporation, a manufacturer of unlicensed devices, notes:

The problem we have identified here shows a fundamental problem in the use of the interference temperature concept. That is, there is no good way for a sharing device to determine, based on a measurement of its own environment, if it will interfere with another device in its range. And this simulation is a very simplistic one. Adding more complex effects, such as signal fading, would case [sic] even more uncertainty.¹⁵

¹² Motorola Comments at 11–13.

¹³ Comments of Nokia, Inc. at 5.

¹⁴ Wi-Fi Alliance Comments ¶ 7.

¹⁵ Proxim Comments at 9. Proxim goes on to note that some of the approaches in the *Notice* that would purportedly the problems identified by its simulation are “much more complex to implement, involving central coordinators, location capability, and possibly grids of RF monitoring devices. . . . [I]mplementing any such solution is certain to be very complicated.” *Id.* at 11.

Proxim also concluded that “[t]he best chance of making a useful [temperature] measurement is to measure the signal from nearby [users of licensed services]. This can only happen if the receivers are also transmitters, which may not always be the case.”¹⁶ Because neither broadcast radio or television receivers, whether they are analog or digital receivers, have transmitting capability, even Proxim recognizes that the interference temperature metric cannot be used in broadcast bands. Listeners and viewers of free-over-the-air radio and television will thus receive no benefit from the interference temperature metric. Moreover, MSTV and NAB agree with Cingular and BellSouth, that in order “[f]or the market-oriented licensing model to work, however, there must be a clear distinction that a band of spectrum is intended for licensed use or unlicensed use but not both.”¹⁷ And as Ericsson, Inc. notes, the benefits of “creating some short-term opportunities for spectrum access by unlicensed devices” is far outweighed by the harm to licensed services and to licensees’ incentive to develop technology to continue to maximize spectrum use.¹⁸

Thus, the Commission should recognize that even those that stand to gain from new opportunities for unlicensed use recognize that the interference temperature approach poses such significant technical challenges that it is not a viable practical option. MSTV and NAB reiterate their view that the proposed interference temperature metric should not be used as a basis for making spectrum management decisions.

¹⁶ *Id.* at 10.

¹⁷ Cingular Wireless and BellSouth Comments at 5.

¹⁸ Comments of Ericsson, Inc. at 3–4.

B. Introducing Unlicensed Devices In The Broadcast Spectrum Bands Would Result In Significant Harm.

In the interference temperature approach outlined by the Commission, the idea that unlicensed devices would be permitted to operate as long as the detected interference temperature does not exceed a predetermined limit is premised on the ability of such devices to make accurate predictions of interference temperature at receivers. As discussed above, the majority of comments filed in response to the *Notice* recognized the significant technical and practical challenges to accurately measuring the interference temperature metric and relying on those measurements to predict the effect of new unlicensed operations on primary licensed users. Thus, the interference temperature metric cannot be used to justify the introduction of unlicensed devices in licensed spectrum bands without a very high probability of significant harm to users of incumbent spectrum services. Even assuming it is possible to settle on a single interference temperature limit that would guarantee that users of licensed services would not experience interference, unlicensed devices will not be technically capable of determining with sufficient accuracy whether the interference temperature at a victim receiver's location exceeds the permissible limit.

Moreover, even if the interference temperature metric were not fraught with technical challenges that keep it from successfully being implemented, there are inherent problems with allowing unlicensed devices to operate in spectrum intensively used by incumbent licensed services. Several commenters echoed MSTV and NAB's concern that there would be no effective means for enforcing rules that would require unlicensed devices to cease operating or otherwise change their operating characteristics if the interference temperature limit were

exceeded.¹⁹ Once unlicensed devices are introduced into the market and sold directly to consumers, they become difficult if not impossible to locate and then control should they cause interference. Even though unlicensed devices would be required by rule to cease operating should they cause interference, the reality is that this rule cannot be enforced once the devices are in the hands of consumers.²⁰ MSTV and NAB strongly agree with Inmarsat that, because under current rules manufacturers of unlicensed devices are not responsible for misuse by end users, the end result would be “devastating” if the Commission’s assumptions and metric calculations “prove wrong” as “there is no way to put the proverbial genie back in the bottle.”²¹ Before even contemplating authorizing higher-powered unlicensed devices in any shared band, the Commission must establish means to identify and locate sources of interference and must develop a rapid, efficient process for shutting down interfering devices. The difficulties the Commission has faced in dealing with pirate radio stations do not provide any reason to believe that unexpected interference from unlicensed devices could be rapidly eliminated.

The concerns raised by various commenters regarding unlicensed underlay operations apply generally to all licensed spectrum bands.²² Commenting parties understandably

¹⁹ See, e.g., Comments of the Society of Broadcast Engineers, Inc. (SBE) at 2; Comments of AT&T Wireless Services, Inc. at 24–26; Comments of Inmarsat Ventures Ltd at 19.

²⁰ MSTV/NAB Comments at 10.

²¹ Inmarsat Comments at 19.

²² NAB and MSTV note that in its recent *Millimeter Wave* proceeding, the Commission appeared to recognize the harm to licensed services that would result if unlicensed underlay operations were permitted in spectrum used by licensed services. In deciding not to permit unlicensed underlay operations in the 71–76 and 81–86 GHz bands, the Commission explained: “Loea [Communications Corporation] explains that equipment that has been developed for deployment in the 71–76 GHz and 81–86 GHz bands was not engineered to operate in a Part 15 environment. As such, an underlay of unlicensed devices here could detrimentally affect the quality, and thus, buildout of service.” *Allocations and Service Rules for the 71–76 GHz, 81–86 GHz and 92–95 Ghz Bands*, WT Docket No. 02-146, FCC 03-248, ¶ 41 (rel. Nov. 4, 2003).

focused on the characteristics of their own licensed services in further explaining why their respective spectrum bands would be ill-suited for unlicensed underlay operations. These comments reinforce the idea that there is no single “one-size-fits-all” solution when it comes to implementing spectrum management reform in bands allocated to different spectrum-based services. In this regard, over-the-air television broadcasting is similarly ill-suited for a one-size-fits-all approach to spectrum management. Over-the-air broadcasting has unique characteristics that have been discussed at length by MSTV and NAB in past proceedings as well as in the comments filed in this proceeding.²³ For example, unlike other wireless services, Americans keep their television receivers on for an average of 7 hours per day. From the transmission perspective, many television stations operate 24 hours a day, seven days a week. Also, broadcasting is an open architecture system, which means that broadcasters have no control over the receivers used to receive broadcast services.²⁴ Unlike other services, broadcasters would not be in a position to respond to interference problems should they arise. Furthermore, television broadcasters are in the midst of a complicated transition to DTV, while radio broadcasters are beginning to implement In Band On Channel (“IBOC”) digital technology. Even the prospect of introducing new, uncontrollable unlicensed devices in the broadcast spectrum would only complicate and further delay these transitions. In the television broadcast context, the digital transition is finally showing signs of achieving wider acceptance. Increasing the likelihood of interference to DTV broadcast services would upset the delicate balance of the transition and

²³ See, e.g., MSTV/NAB Comments at 11–14; Comments of MSTV/NAB in ET Docket No. 02-380, at 5–11 (Apr. 17, 2003); Comments of MSTV and NAB, ET Docket No. 02-135, at 3–7 (Jan. 27, 2003).

²⁴ See Comments of MSTV/NAB, ET Docket No. 02-380, at 5–6 (Apr. 17, 2003).

would be contrary to the Commission's goal of completing the transition to DTV and reclaiming valuable spectrum.²⁵

C. The Commission's Goal Of Increasing Opportunities For Access To Spectrum Is Better Served Through Means Other Than The Interference Temperature Approach.

The comments filed in response to the *Notice* reinforce MSTV and NAB's belief that the Commission's primary goal of increasing opportunities for access to spectrum is better achieved through means other than spectrum sharing enforced under a complex and unworkable interference temperature approach. The Wi-Fi Alliance echoes MSTV and NAB's suggestion that new opportunities for unlicensed devices are better provided in spectrum bands dedicated to unlicensed operations rather than in bands where such devices would have only opportunistic access and would have to be designed to protect against interference to and from incumbent and primary licensed services.²⁶ Dedicating spectrum for unlicensed operations gives device manufacturers the economic incentives to invest in manufacturing, marketing, and selling unlicensed devices, and would promote the continued rapid growth experienced by unlicensed technologies such as Wi-Fi.

II. THE COMMISSION SHOULD WITHDRAW ITS PROPOSAL TO ADOPT THE INTERFERENCE TEMPERATURE APPROACH AND PERMIT UNLICENSED OPERATIONS IN THE 12.75–13.25 GHz BAS BAND.

In light of the overwhelming criticism of and opposition to the interference temperature metric and its use as a basis for introducing new unlicensed operations in licensed spectrum bands, MSTV and NAB urge the Commission not to consider implementing this

²⁵ See MSTV/NAB Comments at 12–14.

²⁶ Wi-Fi Alliance Comments ¶ 7.

approach in any licensed spectrum band. MSTV and NAB join the other commenters that argue that proceeding at this time with a Notice of Proposed Rulemaking is premature.

In particular, MSTV and NAB oppose the Commission's proposal to apply the interference temperature approach and permit unlicensed devices to operate in the 12.75–13.25 GHz band. As discussed in more detail in our comments, the 12.75–13.25 GHz band is used for important Broadcast Auxiliary Service ("BAS") mobile pickup operations such as electronic news gathering, and introducing potentially interfering unlicensed devices in this band would threaten these vital services.²⁷ MSTV and NAB further endorse the comments of the Society of Broadcast Engineers, Inc. ("SBE"), which describe in detail the potential impact of the Commission's proposed rules on BAS services in this band.²⁸ SBE effectively points out the flaws in several of the Commission's technical assumptions regarding licensed BAS links in the 12.75–13.25 GHz band, including the distance between an unlicensed device and a licensed BAS station, the directionality of BAS station antennas, the attenuation of transmissions by unlicensed devices caused by physical structures such as buildings, and the desired-to-undesired ratio that will be adequate to protect licensed BAS stations from harmful interference.²⁹ SBE also describes the potential engineering harm to mobile TV pickup stations that would result from the Commission's proposal to implement the interference temperature metric and introduce unlicensed devices in the 12.75–13.25 GHz band.³⁰

²⁷ MSTV/NAB Comments at 16–17.

²⁸ SBE Comments at 2–6.

²⁹ SBE Comments at 2–5.

³⁰ SBE Comments at 5–6.

Accordingly, MSTV and NAB urge the Commission to withdraw the proposal to implement the interference temperature metric and permit unlicensed devices to operate in the 12.75–13.25 GHz band. The newsgathering function of local television stations that use this band for BAS operations is too vital to local communities, public safety, and national security to be jeopardized by an untested and untried approach to spectrum management. We strongly agree with the New York State Office for Technology, that “[a]ny band used by Public safety and for operations supporting critical communications will have a very low interference threshold. . . . [E]ven our AM or FM broadcast should be considered as well. In times of natural or manmade disasters, citizens look to their local AM/FM or TV stations for news and information.”³¹ The Commission must ensure that communications are not subjected to undue interference from a virtually unidentifiable source, such as an unlicensed underlay device.

* * *

MSTV and NAB urge the Commission to recognize the widespread opposition to implementing the interference temperature approach to spectrum management outlined in the *Notice*. Commenters ranging from incumbent licensees to equipment manufacturers to even proponents of unlicensed operations recognize the technical challenges to implementing the interference temperature approach. The Commission should limit its use of the interference temperature metric to a monitoring function in which it learns more about the real world interference environments in various licensed bands, and should either withdraw its plans to implement the interference temperature approach to spectrum management or at least defer such plans until it has undertaken significantly more analysis and real-world testing.

³¹ Comments of New York State Office for Technology, *Statewide Wireless Network*, at 39.

Respectfully submitted,

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